FLORIDA POLYTECHNIC UNIVERSITY

Ethics

Ethical Decision Making in STEM Fields

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What is Ethics?

A Few Definitions

Ethics Definition 1

- **“Moral principles that govern a person’s behavior or the conducting of an activity.”**
  - *Oxford Languages*

Ethics Definition 2

- **“Ethics or “moral philosophy” is a branch of philosophy that involves systematizing, defending, and recommending concepts of right and wrong behavior.”**
  - *Wikipedia*

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Ethical Principles

Building a Foundation

- **Responsibility**:
  Engineers must take responsibility for the safety and reliability of their designs, products, and processes.
- **Integrity**:
  Honesty and transparency in reporting data, processes, and outcomes are crucial to maintaining trust.
- **Respect for Life**:
  Prioritizing the health, safety, and welfare of individuals and communities affected by engineering and design decisions. Avoiding harm to people through careful consideration of potential risks and outcomes.
- **Respect for Environment**:
  Ensuring that engineering and design practices minimize negative impacts on the natural world. Promoting sustainable development and responsible use of resources to protect ecosystems for future generations.
- **Fairness**:
  Ensuring equitable access to technology and resources, and avoiding discrimination or bias in design and implementation.

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Individual vs. Organizational

Ethics

Individual ethics remain the same regardless of activities or location, while **organizational ethics** differ depending on industry and the role of an employee.

The various values an individual prioritizes can sometimes overlap between organizational and individual ethics.

- **Individual** ethics tend to be informal and flexible.
- **Individual** ethics are acquired from the community, religion, or family.
- **Organizational** ethics are usually formal and organized in a document.
- **Organizational** ethics are learned and followed when a person associates with or joins an organization.

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STEM and Ethics

Stakeholders for Ethics

Society & Environment

- Public safety
- Climate change
- Sociocultural effects
- Quality of life

Profession

- Integrity and Public trust
- Reputation
- Knowledge sharing
- Mentorship

Clients & Employers

- Solving the problem
- Regulatory requirements
- Adhering to contracts
- Conflict of interest

Peers

- Mutual respect
- Acknowledge peer work and credit
- Support professional development

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STEM and Ethics

Stakeholders for Ethics

Society & Environment Profession Clients & Employers Peers

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STEM and Ethics

A Broad View

- **Public Trust:**

  Ethical practices build trust between engineers, designers, and the public.
- **Safety and Well-being:**

  Ethical considerations help prevent harm to people, communities, and the environment.
- **Professional Reputation:**

  Upholding ethical standards is vital for the credibility and integrity of the engineering profession.
- **Legal and Regulatory Compliance:**

  Ethical decision-making ensures adherence to laws and regulations, preventing legal consequences and liabilities.

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Common STEM Ethical Dilemmas

Navigating Gray Areas

- Safety vs. Cost:

  Deciding whether to compromise safety standards to reduce costs.
- Confidentiality vs. Transparency:

  Balancing the need to keep certain information confidential with the obligation to be transparent about potential risks.
- Innovation vs. Risk:

  Weighing the potential benefits of new technology against the unknown risks it might pose to society.
- Environmental Impact vs. Development:

  Considering the trade-offs between technological development and its impact on the environment.

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Some Specific Examples

- **Electrical Engineering**
  - **Scenario**: Using substandard materials for electrical components.
  - **Explanation**: This can lead to safety hazards, equipment failure, and potential harm to users, violating ethical standards and endangering lives.
- **Mechanical Engineering**
  - **Scenario**: Designing a product with planned obsolescence.
  - **Explanation**: Intentionally shortening product lifespan for profit conflicts with sustainable practices and consumer trust.
- **Business Analytics**
  - **Scenario**: Manipulating data to present misleading conclusions.
  - **Explanation**: Altering data for favorable outcomes compromises the integrity of research and can lead to unethical business decisions.

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Some More Specific Examples

- **Computer Science**
  - **Scenario**: Implementing biased algorithms in AI systems.
  - **Explanation**: Bias in algorithms can result in unfair treatment of users, violating principles of fairness and inclusivity in technology.
- **Environmental Engineering**
  - **Scenario**: Ignoring environmental impact in project design.
  - **Explanation**: Neglecting ecological consequences can cause long-term harm to ecosystems and communities, breaching the ethical responsibility to protect the environment.
- Civil Engineering
  - **Scenario**: Overlooking structural safety to cut costs in construction.
  - **Explanation**: Compromising on safety standards for financial gain can lead to structural failures, endangering public safety and violating ethical engineering principles.

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Societal Consequences

Tying Ethics to Outcomes

- If a gas tank is positioned too close to the bumper, it might explode from a small accident.
- If a medical instrument isn’t accurate, improper doses of medication can be given.
- If a process for refining gas produces too much toxins, it harms the local community.
- If software used in autonomous vehicles has errors, it could lead to accidents and loss of life.
- If a dam is not properly maintained, it could collapse and cause catastrophic flooding.
- If cybersecurity measures are weak, sensitive personal data can be stolen and misused.
- If faulty electrical wiring is installed, it could cause fires and put lives at risk.
- If water treatment facilities are not properly managed, contaminated water can lead to widespread illness.

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Societal Consequences

In-Class Assignment

- If a gas tank is positioned too close to the bumper, it might explode from a small accident.
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- If software used in autonomous vehicles has errors, it could lead to accidents and loss of life.
- If a dam is not properly maintained, it could collapse and cause catastrophic flooding.
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- If faulty electrical wiring is installed, it could cause fires and put lives at risk.
- If water treatment facilities are not properly managed, contaminated water can lead to widespread illness.

1. Individually, pick one of the scenarios from this list.
2. Spend about 10 minutes writing a paragraph about the ethics of the scenario.
   - *Consider responsibility, integrity, respect for life, respect for environment, or fairness (choose 1).*
   - *Consider public trust, safety and well-being, professional reputation, or legal and regulatory compliance (choose 1).*
3. Submit your paragraph to Canvas as a PDF.

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Do Ethics = Safety?

Not Really…

- Safety is concerned with:
  - Acceptable Risk
  - Compliance
  - Confidentiality
  - Environmental Health
  - Data integrity
  - Operational Safety
  - Emergency Preparedness
- But what about:
  - Conflict of interest
  - Honesty/Dishonesty
  - Societal impact
  - Fairness
  - Accountability
  - Transparency
  - Moral Responsibility
  - Integrity
  - …etc.

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Engineering Code of Ethics

National Society of Professional Engineers (NSPE)

I. Fundamental Canons: articulate the basic components of ethical engineering.

II. Rules of Practice: describe how an engineer should conduct themselves professionally. These elaborate on the fundamental canons directly.

III. Professional Obligations: outline the obligations an engineers have to society through virtues and provide professional guidelines.

https://www.nspe.org/resources/ethics/code-ethics

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Fundamental Canons

Elaboration of the Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

- Hold paramount the safety, health, and welfare of the public.
- Perform services only in areas of their competence.
- Issue public statements only in an objective and truthful manner.
- Act for each employer or client as faithful agents or trustees.
- Avoid deceptive acts.
- Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

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Engineer's Creed (2021)

From NSPE

As a **Professional Engineer**, I dedicate my professional knowledge to the advancement and betterment of public health, safety, and welfare.

I pledge:

- To give the utmost of performance;
- To participate in none but honest enterprise;
- To live and work according to the highest standards of professional conduct;
- To place service before profit, the honor and standing of my profession before personal advantage, and the public welfare above all other considerations.

In humility, I make this pledge.

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Case Study 1

Boeing 737 Max

Background:

- Three Boeing whistleblowers raised concerns about faulty parts and production issues in the 737 Max aircraft.

Ethical Issues:

- **Ignored Warnings**: Safety concerns about defective parts were disregarded.
- **Conflict of Interest**: Meeting deadlines and reducing costs took precedence over addressing safety risks.

Impact:

- **Loss of Life**: 346 deaths resulted from two crashes linked to these issues.
- **Economic Consequences**: Billions lost and global aviation impacted.

Ethical Lesson:

- Addressing safety concerns and prioritizing ethics over profit is critical to avoid catastrophic outcomes.

Discussion Question:

- *How can companies ensure that whistleblower concerns are effectively addressed without compromising on deadlines or costs?*

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Case Study 2

Algorithmic Bias in Criminal Justice

Background:

- The **COMPAS** (Correctional Offender Management Profiling for Alternative Sanctions) tool developed by Northpointe has been criticized for biased predictions against racial minorities. Biases in machine learning algorithms used for criminal justice risk assessments have led to unfair treatment of marginalized groups.

Ethical Issues:

- **Bias and Discrimination**: Algorithms often reflect historical biases, resulting in unjust outcomes.
- **Lack of Transparency**: The decision-making process is opaque, hindering accountability.

Impact:

- **Injustice**: Biased outcomes can lead to unfair sentencing and perpetuate inequalities.
- **Erosion of Trust**: Public trust in technology and justice systems is undermined.

Ethical Lesson:

- Algorithms must be fair, transparent, and accountable to avoid reinforcing systemic biases.

Discussion Question:

- How can we ensure that machine learning algorithms in criminal justice are free from bias and protect all individuals equally?

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Case Study 3

Google’s Project Nightingale

Background:

- In 2019, Google secretly acquired healthcare data from millions of Americans through its partnership with Ascension without obtaining patient consent. The project, known as Project Nightingale, raised significant ethical concerns about data privacy.

Ethical Issues:

- **Lack of Consent**: Patient data was collected and shared without their knowledge or permission, violating principles of informed consent.
- **Data Misuse**: The scope and use of this sensitive health data were not transparent, raising concerns about potential misuse.

Impact:

- **Privacy Violation**: The incident sparked public outrage and regulatory scrutiny over how healthcare data should be handled.
- **Loss of Trust**: The secrecy surrounding the project damaged public trust in both Google and the healthcare provider.

Ethical Lesson:

- Transparent data practices and explicit consent are crucial when handling sensitive information, especially in the healthcare sector.

Discussion Question:

- How might incidents like Project Nightingale erode trust in not only the companies involved but also in the broader technology and healthcare sectors?

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